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**UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA**

An economic assessment of the effects of the Apple Agreement in Australia

20th October 2020

Privileged and Confidential

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Section 1

Introduction and summary

- 1.1 Apple has imposed a Licence Agreement on Spotify (the "Agreement") in which Apple imposes restrictions on Spotify's ability to access Apple's iOS platform, which is needed by Spotify to provide some of its music streaming services to end-consumers with iOS devices.¹ The restrictions on which Spotify's complaint against Apple focuses are interconnected: (i) mandating the use of Apple's In-App Purchase ("IAP") payment mechanism for unlocking any paid functionality of the app, including subscriptions, (ii) charging a 30% commission on in-app sales of digital content to consumers using IAP, and (iii) imposing severe and arbitrarily enforced marketing restrictions to developers who forgo the use of IAP and are unable to sell in-app to consumers.² After attempting to incorporate the additional 30% cost of IAP in its pricing and compete with Apple Music with a price differential for approximately a year, Spotify found that to be unviable and turned off premium conversion in the iOS platform in May 2016.
- 1.2 The Agreement has a direct restrictive effect on competition for music streaming services on iOS, and also several indirect restrictive effects on this competition. The direct effect of the Agreement is that it has reduced the competitive pressure Spotify (and other music streaming services) place on Apple Music, leading to a less competitive outcome for music streaming services. In particular, the agreement restricts Spotify's ability to effectively market its Premium service to users of Spotify's Free service, and in Spotify's experience Free users are the most important source of subscribers to its Premium service.
- 1.3 The Agreement also has, and continues to have indirect negative effects on competition for music streaming services. Spotify's business and continued growth depend on investment and innovation, which is likely to have been harmed by the reduced cash-flows resulting from the reduction in subscribers for Spotify's Premium service on iOS. As a consequence of these direct and indirect adverse effects consumers are harmed by the Agreement.
- 1.4 In this report we present evidence on the direct effects on the competition for music streaming services in Australia of the Agreement. First, we provide evidence from the experiment that Spotify conducted in Australia in December 2018, along with [REDACTED]

¹ The developers must also agree to Apple's App Store Review Guidelines which define the conditions that apps must meet to be eligible for inclusion in the App Store. For the purposes of this report, the Agreement refers to both the License Agreement and the Guidelines.

² Spotify's Complaint to the European Commission dated 11 March 2019 ("Spotify's complaint"), section 3.

[REDACTED]
[REDACTED], and then we provide econometric estimates of the negative effect of the Agreement has had on the growth of Spotify's Premium users on iOS in Australia.

1.5 In December 2018 Spotify conducted an experiment in Australia [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

1.6 The results of the experiment in Australia are confirmed by [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

1.7 Our econometric analysis demonstrates that the Agreement materially reduced the growth of Spotify's paid subscribers on iOS in Australia, compared with the rate of growth of Spotify on Android, where such restrictions do not apply. Overall, the econometric results suggest that without the Agreement the number of Spotify's Premium subscribers on iOS in Australia would be [REDACTED] higher compared to how many subscribers it had with the Agreement. Our analysis can be used to identify the separate effects of different aspects of Apple's conduct, as follows:

- a. We find that Spotify's Premium subscriptions on iOS would have been [REDACTED] higher between June 2014 and May 2015, but for the high subscription price that Spotify was forced to implement as a result of the 30% IAP charge.
- b. We further find that Spotify's Premium subscriptions on iOS would have been [REDACTED] [REDACTED] higher from June 2015 on, as a result of the launch of Apple Music at a lower price which Spotify could not match given the 30% IAP charge.
- c. In addition, Spotify's Premium subscriptions may have been [REDACTED] higher had Spotify not been forced to turn off Premium subscription on iOS from June 2016 onwards in response to the Agreement (or had it been able to continue to convert Premium subscribers on iOS through other payment mechanisms, which the Agreement prevents).

1.8 The immediate effect of Apple's Agreement is reduced competition for music streaming services. This loss of competition may result in higher prices or lower quality of music apps for end consumers on the iOS platform and eventually on other platforms. Reduced subscriber growth rates harm Spotify's margins, pushing back the crucial 'break even' date at which the business becomes profitable. Furthermore, Spotify's investment and R&D depend upon its

cash-flows and these can be expected to be lower as a result of the Agreement, harming Spotify's dynamic competitiveness and resulting in a less innovative industry.

- 1.9 There is also a wider effect within the digital music distribution market because the loss of volume by Spotify reduces its incentive and ability to engage in incremental R&D and also generates potential 'waterbed effects', whereby Spotify and possibly other music app developers are forced to charge higher retail prices on other platforms. We note that the effects are likely to be more severe for other, smaller, music apps such as Deezer and Tidal, all of which have implemented higher subscription prices on iOS as a result of Apple's 30% fee on subscriptions, thus affecting their subscriber rates and margins. All this leads to reduced competition and harm to consumers more widely

Structure of the report

- 1.10 The remainder of this document is structured as follows:
- a. Section 2; describes the Australian results of the experiment performed by Spotify in December 2018 to quantify the effect on Spotify's subscribers of Apple's conduct as far as it has caused a reduction in Premium conversion of Spotify's users on the iOS platform. And,
 - b. Section 3 describes the effects of the Agreement on Spotify's subscriber base in Australia using an econometric analysis of historical data on Premium users.
- 1.11 There is one supporting annex which provides further details on the econometric analysis of historical data.

Section 2

Results of Spotify's experiment for Australia

2.1

[REDACTED]

[REDACTED] These results

therefore confirm the results found in our DiD analysis.

Spotify's experiment run in Australia in December 2018

2.2

[REDACTED]

2.3

[REDACTED]

2.4

[REDACTED]

[REDACTED]

[REDACTED]

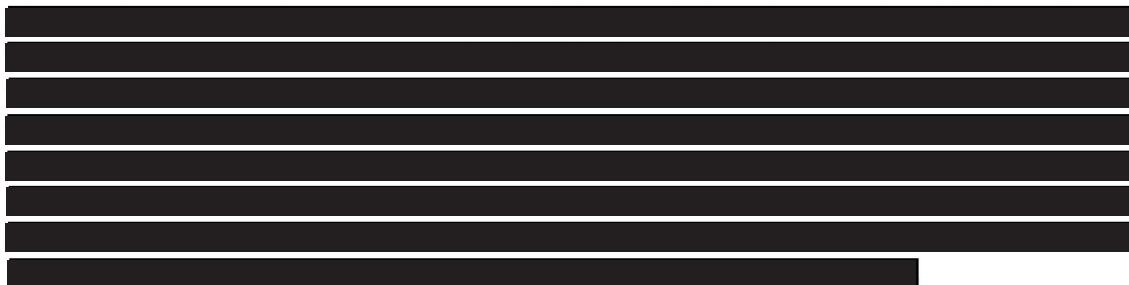
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[REDACTED]

[REDACTED]

[REDACTED]

2.12 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

2.13 [REDACTED]
[REDACTED]
[REDACTED]
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■ [REDACTED]
■ [REDACTED]
■ [REDACTED]
■ [REDACTED]
■ [REDACTED]

2.14 [REDACTED]

[REDACTED]

2.15 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

2.16

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Section 3

Assessment of the direct effects of the Agreement based on historical data

3.1 The *direct anticompetitive effect* of the Agreement is a significant reduction in the number subscribers on the iOS platform for music apps like Spotify compared with the expected number without the Agreement. This reduction in the number of iOS subscribers reflects the reduced competitive pressure that Spotify and other music streaming apps place on Apple Music due to the Agreement. The loss of subscribers on the iOS platform has had an immediate effect on Spotify's profitability and created a delay in Spotify reaching its break-even point. Moreover, the reduction in the subscribers on iOS has also adversely affected dynamic competition in the music streaming sector, as the reduction in iOS subscribers has reduced Spotify's cashflow and hence in all likelihood reduced Spotify's R&D and investment, which depend upon Spotify's cash-flows.

Reduction in Spotify's Premium subscribers on the iOS platform

3.2 We have used historical information on Spotify's number of Premium subscribers by platform to assess whether the Agreement has had a negative impact on the number of these subscribers on the iOS platform. Specifically, we used a difference-in-differences ("DiD") model to assess the impact of a number of events related to the Agreement on the number of Spotify's Premium subscribers on the iOS platform.

3.3 There are several events related to the Agreement that may have had an impact on Spotify's Premium subscriber base on the iOS platform. The most relevant ones are:

- a. Spotify's implementation of Apple's IAP system in June 2014 that forced Spotify to raise its price from A\$11.99 to A\$15.99 per month.
- b. The launch of Apple Music on iOS in June 2015 at the price of A\$11.99 per month.
- c. Spotify effectively being forced to decide to turn off Apple's IAP and forgo in-app conversions to Premium on iOS in May 2016.

N.B. Apple's New Guidelines making the use of IAP mandatory for any in-app sales of digital content were introduced in June 2011, but this was prior to the launch of Spotify's music streaming services Australia, which occurred in 2012.

- 3.4 To estimate the effects of the three above events on the number of subscribers to Spotify's Premium service on iOS we have used a DiD model.⁵ A DiD model compares the performance of a group affected by an event with a very similar group unaffected by the event, both before and after the event. Assuming the performance of the group unaffected by the event provides an accurate estimate of what the performance of the affected group would have been, absent the event, then any change in the difference between the performance of the two groups following the event can be interpreted as an estimate of the effect of the event.
- 3.5 As we have data on the stock of Spotify's Premium subscribers by platform for Australia, we use the number of Premium subscribers on Android as the control group, and hence compare the evolution of Spotify's Premium subscribers on the iOS platforms with the evolution on the Android platform. The choice of the Android platform as the control group is rooted in its similarities with the iOS platform, including the type of device (i.e. a smartphone), the similarity in the way the Spotify service is accessed (i.e. very similar apps), and most importantly that any other events that may have also had an impact on the number of subscribers, are likely to have very similar effects on the number of subscribers on both the Android and iOS platforms. For example, the reduction in the price of the Family product in 2016 is likely to have had very similar effects on the number of subscribers on both platforms.

The stock of subscribers to Spotify's Premium service

- 3.6 Figure 2, below, shows the stock of Spotify's Premium subscribers on the iOS and Android platforms in Australia. Following standard practice in this industry, the stock of subscribers in our analysis is measured as the Monthly Active Users (MAU) of Spotify's paid tier.^{6,7} The information on the number of subscribers by platform in Australia is available for the period 30th January 2014 to 5th August 2020.
- 3.7 As reflected in the figure, the stock of Spotify's Premium subscribers is larger on the iOS platform than on the Android platform, and although the stock of subscribers on both platforms has increased continuously over the period, the stock of Premium subscribers on the iOS platform has increased by more than the stock of Premium subscribers on the Android platform

⁵ The first 'difference-in-differences' estimator was used in Card, D. and Krueger, A. B. (1994), "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania", *American Economic Review*, 84, 772–793. For additional references on this approach see for instance Abadie, A. (2005). Semiparametric difference-in-differences estimators. *The Review of Economic Studies*, 72(1), 1-19.

⁶ Although our analysis does not take inactive users into consideration, there is no reason why the Agreement would have on them an effect opposite to the one produced on active users. As such, our analysis is either precise in attributing no effect, or conservative.

⁷ Monthly Average Users is Spotify's metric for the number of users of its service. A 'user' is anyone who has accessed at least one stream, in the last 30 days. MAU's can be calculated by tier (free or Premium) and by platform, amongst other possible classifications. A small proportion of subscribers are inactive and we exclude these from our analysis, but as the proportion is relatively stable this exclusion has no material impact on the findings.

over the whole period. However, the short-term fluctuations of the stock of both platforms appear broadly similar, which provides support for using the Android platform as a comparator for the iOS platform providing the DiD analysis takes accounts of the trends in these data.

Figure 2: Evolution of the stock of Spotify's premium subscribers



Notes: For each of the platforms the figure shows MAU on mobile handsets.
Source: CompassLexecon based on information provided by Spotify.

- 3.8 Figure 3 shows the difference between the logarithms of the stock of Spotify's Premium subscribers on the iOS and Android platforms. This difference falls in the early part of the period, before remaining constant over the latter part of the period. This suggests that in the first part of the period the trend growth rates of the stock of subscribers on the two platforms were different, and this needs to be allowed for in the DiD analysis.

Figure 3: Difference between the logarithms of subscribers on iOS and Android

Notes: For each of the platforms the figure shows MAU on mobile handsets.
 Source: CompassLexecon based on information provided by Spotify.

- 3.9 We have used a standard DiD model to estimate what effect each of the three events listed in paragraph above, had on the (logarithm) of the number of Spotify Premium users on the iOS platform, and estimate the following regression:

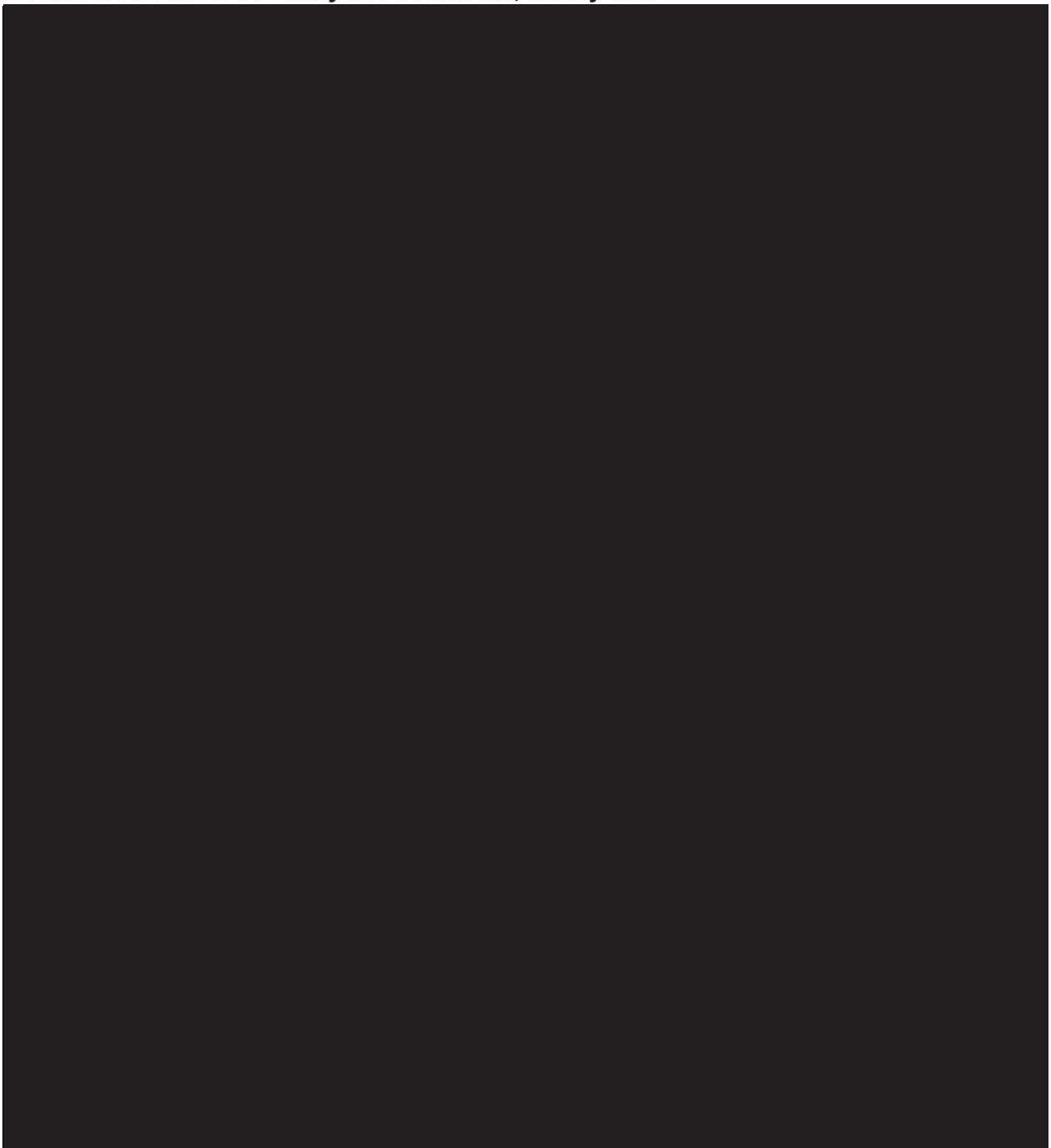
$$MAU_{it} = \alpha + \beta \times iOS_i + \gamma_1 \times IAP_t + \gamma_2 \times Apple\ Music_t + \gamma_3 \times Turn - off_t + \delta_1 \times IAP_t \times iOS_i \\ + \delta_2 \times Apple\ Music_t \times iOS_i + \delta_3 \times Turn - off_t \times iOS_i + f(t)_i + MD_t + \varepsilon_{it}$$

Where: MAU_{it} is the logarithm of the number of monthly active Premium users on platform i in period t , iOS_i is a dummy variable that takes value one when i represents the iOS platform, and zero when it represents the Android one, IAP_t is a dummy that takes value one after Spotify's implementation of IAP in June 2014, $Apple\ Music_t$ is a dummy that takes value one after the launch of Apple Music in May 2015, $Turn - off_t$ is a dummy that takes value one after Spotify's turned off the conversion to premium on iOS platform in June 2016, $f(t)_i$ is the time trend on platform i , MD_t are a set of weekly/monthly fixed effects and ε_{it} is the error of the model.

- 3.10 The three parameters are of interest are δ_1 , δ_2 and δ_3 as they capture the relative difference between Spotify's Premium users between iOS and Android after each of the events related to the Agreement, and hence provide estimates of the effects of these events on Spotify's users on the iOS platform.

- 3.11 As the two above figures show, trends in the total number (the stock) of Premium users may differ between the two platforms over the period. We included the $f(t)_i$ term in the DiD model to allow for this. We have modelled the time trend in two ways:
- First, we included a linear time trend in the model to capture the trend in the stock of Premium users, and to allow for the possibility there are differences in this trend on the two platforms we also estimated a version of the model that includes a separate linear time trend for the iOS platform.
 - Second, we included a quadratic time trend to capture the trend in the stock of Premium users. The advantage of using a quadratic time trend is that it is a more flexible way of allowing for the trend than a linear time trend, as a quadratic time trend allows for the possibility that the trend changes gradually over the period, and Figure 3 suggests that the trend changed over the period. Again, to allow for the possibility there are differences in the trend on the two platforms we also estimated a version that includes a separate quadratic time trend for the iOS platform.
- 3.12 We estimated these various versions of the DiD model using weekly data for the period February 2014 to August 2020. As these data are for the monthly stock of users, there is by construction some overlap and hence correlation between the data for one week and the data for the previous three weeks, so we report Newey-West standard errors. We also estimated these DiD models using monthly data to avoid this overlap/correlation issue – these results are reported in Annex A.
- 3.13 Table 4 below contains the results of the weekly version of DiD.

Table 4: Results of DiD analysis for Australia, weekly data



Notes: Newey-West standard errors are in brackets below the estimated coefficient, *** indicate statistically significant at the 1% level, ** the 5% level and * the 10% level.

Source: CompassLexecon estimates based on Spotify data

3.14 The DiD models show the following results of the effects of the three events:

- a. The introduction of IAP, which led to a substantial increase (~30%) in the price of Spotify's Premium service on iOS, is associated with a material reduction in the number of Premium users on iOS. [REDACTED]
[REDACTED]
[REDACTED]
- b. The launch of Apple Music at a substantially lower price than Spotify on iOS (a price which Spotify could not match given the IAP charge) is also associated with a further material reduction in the number of Spotify's Premium users on iOS. [REDACTED]
[REDACTED]
[REDACTED]
- c. The turn-off of IAP, which meant that iOS users could only subscribe to Spotify's Premium service may be associated with a small reduction in the number of Spotify's Premium subscribers on iOS, [REDACTED]
[REDACTED]
[REDACTED]

3.15 Although each version of the DiD model finds that the three events have similar effects on the number of Premium users on iOS, the precise size of these estimated effects varies across the models depending on how exactly the trends in these data are allowed for in the model. The quadratic time trend is a more flexible way of modelling/capturing the time trends than the linear time trend (while also including the possibility of a linear trend), and the results in both columns (3) and (4) of the above table show [REDACTED]. Moreover, in column (4) the quadratic time trend variables for the iOS platform [REDACTED]. Therefore, we have taken the estimates of the model in column (4), which uses a quadratic time trend to capture the trends and allows these trends to vary between the platforms, as our estimates of the effects of the three events.

3.16 The estimates of the model in column (4) show the introduction of IAP led to [REDACTED] fall in the number of Premium users on iOS and the launch of Apple music led to a [REDACTED] fall, but the turn-off of IAP [REDACTED], so the overall effect of the Apple Agreement has been to reduce the number of Premium users on iOS [REDACTED] compared with the number without the Agreement. Furthermore, this was no one-off effect, but the result of a reduction in the rate of subscriber growth. Other factors being equal, the gap between Spotify's actual subscriber levels and the levels it would have achieved without the Agreement will become larger in the future, if the Agreement is not changed.

Annex A

Results of the monthly DiD model

Table 5: Results of DiD analysis for Australia, monthly data



Notes: Standard errors are in brackets below the estimated coefficient, *** indicate statistically significant at the 1% level, ** the 5% level and * the 10% level.

Source: CompassLexecon estimates based on Spotify data